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ABSTRACT -- KEY POINTS

As fitted to a number of validation datasets, the semiempirical BRDF models continue to perform very well. Both albedo and semiempirical parameter retrievals are not overly sensitive to noise in input measurements. Revision of the BRDF/Albedo ATBD is ongoing, but should be completed very soon.

Algorithm development for the land cover and land-cover change products continued with the assembly of a multidecadal TM database for the Walnut Gulch region of Arizona. Further data development awaits the receipt of better ground truth maps. Applications of neural net classifiers to the mixed pixel problem and to change detection were explored.

TASK PROGRESS

BRDF/Albedo Product

Model Development

During the reporting period, we continued our development of semiempirical models of bidirectional reflectance. Preparation of a paper to the Journal of Geophysical Research documenting the mathematical derivation and properties of the semiempirical kernels was nearly completed during the reporting period.

Model Validation

We also continued BRDF model validation activities by further work with the bidirectional reflectance data for eleven land cover types as provided by Dan Kimes of Goddard Space Flight Center. We also began fitting the semiempirical models to new suites of data acquired under our direction in July, 1994, at the Solar Simulation Laboratory, Changchun, China.

Additional validation efforts involved collaboration with John Miller and Ray Soffer, at York University, on a comparison of the Li-Strahler mutual shadowing model with observations using the CASI sensor made in Miller's laboratory on a forest of artificial trees. Early data analysis showed that the Li-Strahler model fitted the observations quite well, provided that the component signatures were identified properly.

Software and Algorithm Development

We continued significant improvements in the Ambrals code, which fits our semiempirical models to data in an easy-to-use, flexible program environment. We also prepared for the development of beta-delivery software, planned for the summer.

Atmospheric Correction-BRDF Effects

In collaboration with Eric Vermote, we continued developing the BRDF-atmospheric correction loop plan for MODIS.

Sensitivity Studies

Using a theoretical approach, we explored the sensitivity of the retrieval of semiempirical model parameters and albedo to noise in the directional observations. We found that for a noise level of 5 percent, we found that parameters were retrieved with 1-4 percent accuracy for practical cases and albedo was retrieved with accuracies less than 2 percent.

ATBD Revision

The required revision of the BRDF/Albedo ATBD was an ongoing activity during the reporting period. Good progress was made, but because the document required complete revision, the revision draft was still not completed by the end of the reporting period.

Land Cover/Land-Cover Change

During this reporting period, we focused primarily on algorithm development for land cover classification. We continued our work with advanced technology (AT) classifiers -- neural nets, decision trees, adaptive classifiers, etc.

Walnut Gulch

We received a series of TM images and some ground truth information on the Walnut Gulch site from Team Member Alfredo Huete's group, and spent considerable time and effort on registering and radiometrically correcting a time sequence of six selected TM datasets. We began to apply neural net classifiers to the data, but require fine-resolution land cover data as "ground truth" before proceeding with classifier studies.

MAS-BOREAS Data

We requested the navigated and resampled MODIS Airborne Simulator (MAS) data from BOREAS from BORIS, but were unable to secure it during the reporting period. The objective was to provide a land-cover type classification using advanced-technology classifiers from MAS imagery and ground truth provided by the BORIS.

ANTICIPATED ACTIVITIES DURING THE NEXT QUARTER

BRDF/Albedo Product

Our primary activity during the next quarter for the BRDF/Albedo product will be to continue with validation studies, including work with Ray Soffer at York University and Robert d'Entremont of the USAF Geophysics Lab, as well as continued examination of ground and aircraft BRDF datasets. Developing proceedings papers for presentations at IGARSS'95 in Rome (July) will also be an important activity.

Land Cover/Land-cover Change Product

During the next quarter, we will continue to work with the Walnut Gulch dataset, including various trials of advanced-technology classifiers. We will also need to approach the feature selection problem, as MODIS data provide an overabundance of possible measurements to use in per-pixel classification. After receiving the navigated MAS data, we will begin classification of selected portions. We also expect to complete a revision of work on using neural net outputs to predict

pixel mixtures. In land-cover change activities, we will continue our liaison with Eric Lambin at the European Economic Community's Joint Research Center. Activities there focus on land-cover change as inferred from a ten-year record of African AVHRR observations.

PROBLEMS/CORRECTIVE ACTIONS

During this reporting period, we did not encounter any significant problems requiring corrective actions beyond the everyday problems that occur in research and algorithm development.

PUBLICATIONS

A complete, updated list of publications will be provided with the next semiannual report.